# Postprint of Applied Research on Grassroots Communities and Matrix Management Models in Converged Media Technology Platform Development

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## Abstract

In the context of integrated development of emerging media technologies, county-level cities must prioritize the construction of converged media technology platforms, intensify innovation and reform, and enhance media dissemination capacity, influence, and guiding power. Consequently, this study proposes an applied research on the integration of grassroots community and matrix management models in the construction of converged media technology platforms. By designing converged media technology platform hosts, establishing application protection functionalities and platform data security, and developing a construction scheme for converged media technology platforms based on grassroots community and matrix management models, this framework enables comprehensive decision-making and deployment for broadcasting, television, internet, and newspaper publicity operations, thereby facilitating the development and centralized, unified management of converged media technology.

## Full Text

### Research on the Application of Grassroots Community and Matrix Management Models in the Construction of Converged Media Technology Platforms

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**Abstract**

Against the backdrop of emerging media technology integration and development, county-level cities are required to prioritize the construction of converged media technology platforms, strengthen innovation and reform, and enhance media dissemination power, influence, and guidance capability. This paper proposes a research study on the application of grassroots community and matrix management models in converged media technology platform construction. By designing the converged media technology platform host, configuring application protection functions and platform data security, and developing a platform construction scheme based on grassroots community and matrix management models, this approach enables comprehensive decision-making and deployment for broadcasting, television, network, and newspaper publicity efforts, thereby promoting the development and centralized unified management of converged media technology.

**Keywords:** Grassroots Community; Emerging Media; Matrix Management; Converged Media Technology; Platform Construction

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Longgang was approved by the State Council to establish itself as a county-level city on August 16, 2019, and officially inaugurated on September 25 of the same year. On December 30, 2019, the Longgang Converged Media Center was formally established [1]. In this context, the construction of an integrated converged media platform project aims to gradually transform the media center into a community information hub, providing residents with comprehensive community information and integrated services to better satisfy the information needs of the populace [2]. The structural framework of converged media technology platforms is relatively complex, typically encompassing central business services for converged media, supporting infrastructure for media centers, cloud-based media production, construction of management and control platforms, and integration with network services [3]. Leveraging the resources of the Blue Cloud platform, this initiative establishes interconnected communication channels to provide comprehensive services for production operations at the Longgang Converged Media Center [4]. The professional technical infrastructure supporting the converged media technology platform primarily includes large-screen display systems, conference audio systems, video systems, power backup systems, converged media production workstations, information release screens, and recording equipment [5]. The renovation of specialized technical facilities covers approximately 1,480 square meters, upgrading converged media center spaces to meet professional requirements for various business operations while establishing fire protection and access control systems in critical functional areas to satisfy safety broadcast management needs [6]. In accordance with national fire safety standards, specialized rooms for the converged media technology platform have been retrofitted, with the equipment room' s fire suppression system upgraded to a gas-based extinguishing system to meet regulatory requirements

[7].

Given that traditional converged media technology platform construction methods exhibit certain deficiencies in operational services and network integration, this paper designs a novel approach based on grassroots community and matrix management models.

## 1. Application of Grassroots Community and Matrix Management Models in Converged Media Platform Construction

### 1.1 Converged Media Technology Platform Host Design

In the design of the converged media technology platform construction method based on grassroots community and matrix management models, the host structure and functional design are of paramount importance [8]. Since internal traffic within the host in the server area is invisible, achieving virtual traffic visualization is necessary to meet compliance requirements [9]. The platform host must possess data collection and detection capabilities, with information collection functions configured to remotely control and operate virtual traffic on the host, ensuring the stability of the converged media technology platform structure. To address abnormal network traffic conditions within the platform, specific target intrusion identification functions are established on the host. A security Agent plugin is installed on the platform host, primarily responsible for managing the logical topology structure, periodically monitoring the operational status and performance of the converged media technology platform, and adjusting situational awareness functions within the platform through visualized operations. Endpoint Agents conduct continuous security detection on servers, automatically inventorying critical directories such as Web server site directories and maintaining ongoing monitoring of these directories. Leveraging the detection capabilities of IPS devices, a WAF signature database is constructed to identify obfuscated Web backdoor code, enabling the system to determine whether files transmitted or requested within the converged media technology platform constitute Web backdoor code files. Security monitoring functions are deployed at server endpoints on the platform host to provide defense against vulnerabilities within the platform.

### 1.2 Application Protection Function Configuration for Converged Media Technology Platform

The configuration of application protection functions should be based on the host operating system and tailored according to the performance of network isolation devices such as firewalls. The platform must support both virtual machine-level deployment and self-maintained operating systems, with protection functions controlled through the matrix management model. Synchronized provision of operating system-level service layers is required, including OS patch upgrades, vulnerability protection, and antivirus services. Since these functions

necessitate database support, database program upgrade protection and data theft prevention must also be provided concurrently.

Distinct security protections should be implemented according to different business systems. Based on the characteristics of grassroots community management, the platform must provide appropriate business services to end users, making access user security protection crucial during service delivery. First, access identity security is verified using SSL VPN to authenticate user identities and configure corresponding access permissions based on user roles. Client-based agent programs assess the security status of devices accessing the converged media technology platform, preventing non-compliant software operations within the platform. With the rapid development of terminal technology, BYOD (Bring Your Own Device) technology is integrated to jointly verify access method security. Stored procedures for the converged media technology platform are configured to prevent errors caused by parameter misconfiguration during storage processes.

Two primary roles are defined within the platform: administrators and ordinary users. Administrators possess permissions for most application functions and manage all operations of ordinary users in real time. Ordinary user permissions are configured by administrators to ensure that users of different identities have appropriate platform application privileges. The matrix management model typically divides the converged media technology platform into functional modules based on database information, segmenting each module into independent lists, encapsulating lists with information, and ultimately generating an entity class responsible for information lookup operations within the platform, thereby enhancing the efficiency of business logic processing.

### 1.3 Platform Data Security Settings

In the converged media technology platform designed in this paper based on grassroots community and matrix management models, platform data security configuration constitutes a critical component of the construction process. Appropriate data protection methods are adopted, implementing access control, backup, encryption, and rights management to safeguard platform data security. Since content is transmitted between the converged media technology platform and mobile non-linear editing workstations, transmission security and copyright protection are extremely important. This project employs MD5 verification and content copyright protection technology to ensure content transmission and production safety. MD5 encryption and authentication are extracted from media files, with programs completing consistency verification through MD5 during transmission [11]. Digital rights technology addresses copyright identification and protection for low-bit-rate material content that may leak during external mobile non-linear editing. Player identification technology ensures that materials can only be played within authorized players; even if materials are illegally copied, the video content cannot be played normally.

## 2. Converged Media Technology Platform Construction Scheme Based on Grassroots Community and Matrix Management Models

Following the completion of the aforementioned functional designs for the platform, the construction scheme is developed. First, the central network of the converged media technology platform is partitioned into a three-layer network structure with strong independence, ensuring network terminal gateways are located in the core network area and planning central addresses for the converged media technology platform. The converged media index structure of the platform constructed in this paper is illustrated in [Figure 1: see original paper].

As shown in Figure 1, the converged media index for the grassroots community and matrix management model-based platform includes matrix propagation effectiveness, positive media coverage, non-compliant dissemination, channel potential, autonomous propagation, service platforms, and overall network 热度 (heat/popularity). Based on the converged media index, comprehensive quantitative analysis of converged media technology dissemination capabilities is achieved, establishing evaluation criteria for platform construction. A full-network monitoring mode is configured for data crawling, enabling multi-dimensional analysis and mining of converged media technology-related information to provide converged media matrix evaluation services for users. Leveraging the traceability features of blockchain technology, a converged media technology platform management system is constructed to achieve manuscript sharing objectives.

Comprehensively considering the characteristics of grassroots community and matrix management models, the objectives and positioning of the converged media technology platform are clarified. At the current stage, China' s new media dissemination methods primarily consist of television, websites, and broadcasting, with different development visions for converged media corresponding to different dissemination approaches. Based on varying converged media project construction plans, a comprehensive new media dissemination system should be constructed to ensure converged media technology security, supported by the converged media technology platform and combined with various mainstream media to jointly build a dissemination matrix.

For the local content library construction at the converged media center, a gigabit high-performance converged Ethernet switch serves as the core, with downstream areas divided into gigabit network port access zones and 10-gigabit optical port access zones based on connected device port types. The 10-gigabit optical port access zone must accommodate 10-gigabit workstations such as 4K editing stations and content library storage devices, while the gigabit network port access zone connects to migration transcoding servers, data synchronization servers, and other equipment. Considering the number of various port types required in the content library, this scheme specifically selects gigabit high-performance converged Ethernet switches for the gigabit network port ac-

cess zone and 10-gigabit three-layer Ethernet switches for the 10-gigabit optical port access zone.

Customized deep security defense functions are implemented based on multi-dimensional security control strategies involving users, applications, time, and service IPs. According to actual business requirements, network access control permissions and access control rights for network devices are customized. Based on the platform content library, B/S architecture enables rapid image processing, supporting watermark addition (both image and text) without moving the underlying data. Streaming-based clipping processing is implemented for material segmentation, splitting materials into single segments according to business requirements—particularly suitable for news scenarios. The clipping tool supports both annotation-based and physical splitting methods and can integrate with AI engines for intelligent clipping, thereby achieving high-efficiency user experiences. Virtualization technology is employed to create virtualized non-linear editing tools available for on-demand rental, enabling professional high-bit-rate multi-track video and audio production on ordinary office computers. According to the display characteristics of the converged media center' s large screens, data from various business processes is elegantly presented, primarily including production dashboards and news data dashboards.

The production dashboard encompasses command reporting, topic planning, interview assignments, and content library displays for unified command and dispatch, all-media topic selection and reporting, collaborative task distribution and claiming, and coordinated production. It showcases various aggregated content in the unified content library, such as manuscripts, program materials, and news background information for all-media news production. The news data dashboard includes news leads, external media coverage of the city/county, new media matrix, propagation analysis, external newspaper industry, and leadership diligence displays (with external newspaper industry and leadership diligence being alternative options). News leads report the latest and hottest news at national, provincial, and local levels; external media coverage of city/county statistics tracks relevant reports from central and provincial media about the local area; the new media matrix and propagation analysis dashboard statistics track publication and dissemination status on new media terminals; external newspaper industry broadcasts compare layouts and content between local city/county newspapers and competitive media.

The self-built OTN high-speed ring network of Zhejiang Radio and Television Group serves as the transmission backbone, combined with local city/county transmission network access to achieve dedicated network connection requirements between China Blue Cloud and the Longgang Converged Media Center. Dual 10G interface links are selected for access. Considering the "last mile" situation from the OTN backbone network to county-level converged media centers varies significantly with substantial cost differences, OTN bandwidth is generally configured according to the bandwidth selected for the "last mile."

Based on the matrix management model, local production capacity is configured

according to the concept of cloud-edge collaboration and based on the actual needs of the Longgang Converged Media Center. Gigabit-to-desktop implementation provides editing stations, dubbing stations, and background synthesis stations with storage access, while other servers use gigabit connections. To ensure the security of the core content management platform, the technical architecture requires the core media platform to adopt Linux-based operating systems with distributed data platform architecture capabilities. The computing engine provides a series of platform public services—including system space management, access control, data modeling, business modeling, process driving, unified retrieval, and media processing—through microservice deployment. Various business systems push material files and XML information to designated shared areas, from which the media asset system retrieves all files and XML information for identification and archiving to facilitate future user retrieval and utilization.

In summary, fully considering the business service characteristics of grassroots communities and the principles of matrix management models, this paper investigates the specific applications of converged media technology platforms. The analytical methods studied are reasonable, practical, and demonstrate strong implementation capabilities, with adequate supporting construction conditions and significant social benefits. Through this research, we aim to provide assistance for comprehensively achieving decision-making and deployment in broadcasting, television, network, and newspaper publicity work, and for promoting the development and centralized unified management of converged media technology.

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*Note: Figure translations are in progress. See original paper for figures.*